



Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: 3360

Type: **Invited Speaker / Conférencier(ère) invité(e)**

(I) Chiral Belle: Upgrading SuperKEKB with a Polarized Electron Beam

Tuesday, 7 June 2022 11:50 (25 minutes)

Upgrading the SuperKEKB e^+e^- collider with polarized electron beams is under consideration as it opens a new program of precision electroweak physics at the $\Upsilon(4S)$. This Chiral Belle physics program includes determining $\sin^2 \theta_W$ via separate left-right asymmetry (A_{LR}) measurements in e^+e^- annihilations to pairs of electrons, muons, taus, charm and b-quarks using the Belle II detector. The precision that can be obtained matches that of the LEP/SLC world average and enables the probing of neutral current couplings with unprecedented precision in a manner sensitive to their running. At SuperKEKB, the measurements of the individual neutral current vector coupling constants to b-quarks, c-quarks and muons in particular will be substantially more precise than current world averages and the current 3σ discrepancy between the SLC A_{LR} measurements and LEP A_{FB}^b measurements of $\sin^2 \theta_W^{e,f}$ can be addressed. It can also provide the highest precision measurements of neutral current universality ratios. In addition, having a polarized electron beam enables measurements of tau lepton properties, including the tau $g-2$, with unrivaled precision. This presentation will cover the physics motivation and status of the R&D necessary for the upgrades to achieve and measure the SuperKEKB e^- beam polarization.

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Session Classification: T2-3 New Directions in Accelerator-Based Experiments: Future Collider Experiments - Energy and Precision Frontier (PPD) | Nouvelles voies fondées sur des accélérateurs: expériences futures avec collisionneurs - frontière d'énergie et de précision (PPD)

Track Classification: Symposia Day (Tues. June 7) / Journée de symposiums (mardi, le 7 juin): Symposia Day (PPD) - New Directions in Accelerator-Based Experiments